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# United States Patent [19]

Rice

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## [54] DETECTION OF A MULTI-SEQUENCE SPREAD SPECTRUM SIGNAL

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[52] **U.S. Cl.** ..... **375/200**; 380/34

[58] **Field of Search** ..... 375/1, 200, 208, 375/209, 210; 380/34

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[57] **ABSTRACT**

A detector of a multiple-sequence spread spectrum signal uses a Hadamard transform (**106**) to simultaneously correlate a received signal comprising two sequences (**64**) with a plurality of candidate sequences. The received signal is stripped of the first sequence (**65**, **66**), and the signal is permuted (via a table lookup) (**104**). A Hadamard transform is performed on the permuted data and the candidate sequences (**106**). After transformation, the data is permuted again (**112** ) to determine the symbol (sequence) transmitted. Alternatively, Fast Fourier Transforms (FFTs) (FIG. **3**), Winograd Fourier Transform Algorithms (WFTA), or other cyclic correlation algorithms (FIG. **5**) may be used to compute the transformation. In a preferred embodiment, a "pilot" signal is transmitted in quadrature (90 degrees phase offset) with an information-bearing signal. And, a block error correcting code (**150**) (e.g., a modified Reed-Solomon code) is transmitted with the information-bearing signal a(t). The block length of the block error correcting code (**150**) is equal to an integral multiple of the period of the pilot signal. The period of the pilot signal is an integral multiple of the information bearing signal. Thus, carrier recovery, sequence synchronization, and block code synchronization are all achieved simultaneously by correlating (synchronizing) the received signal with a baseband version of the pilot signal.

**9 Claims, 9 Drawing Sheets**